Section 1 - Introduction

This section provides information about this manual and safety issues the reader should be aware of before servicing equipment.

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Purpose

This electronic document provides resource data and detailed instructions to help a qualified service technician isolate failures and perform repairs on the equipment. It provides sufficient detail to enable fault isolation to the modular (printed circuit board) level.

Intended Audience

Reading this manual does not qualify an untrained person to service the equipment. This publication assumes the reader is a skilled and fully qualified electronics technician who has experience servicing medical imaging systems. Factory trained service personnel will benefit the most from this material.

How to Use this Manual

The following subsections describe how to use hardcopy and on-line versions of this manual.

Hardcopy

Hardcopy versions of this manual are organized using tab dividers. Select the section of interest and then refer to the table of contents on the front page to locate the information you require.

On-Line

On-line versions of this manual are organized using a section level navigation screen. Click on the section of interest and then refer to the table of contents on the front page to locate the information you require.

Hazard Notification

The following subsections describe hazard notification conditions.

Danger

Danger Notices advise of hazardous conditions that, if ignored, WILL result in death, or severe personal injury.

Warnings

Warnings advise of hazardous conditions that, if ignored, MAY result in death, personal injury, or equipment damage.

Cautions

Cautions advise of hazards that, if ignored, MAY lead to personal injury or equipment damage.

Notes

Notes supply important information not related to hazards

Safety Summary

Do not attempt to service or maintain this equipment before reading the following safety messages.

Liquids

WARNING: *Always unplug the AC power cord from the AC outlet and use a dry or lightly dampened cloth to clean the system. Do not allow any liquids to leak into the equipment where they can cause electric shock, fires, and short circuits. If such leakage does occur, ensure that all internal circuitry is completely dry before attempting to operate the equipment.*

WARNING: *Never store or operate the system in the presence of conductive fluids like water or saline solution unless the system is adequately protected by an approved bagging or draping system. Conductive fluids can leak into unprotected areas, causing electric shock, fires, and short circuits.*

Electrical Shock

WARNING: *This equipment may contain high power electrical components and must be serviced only by personnel familiar with proper safety procedures for working around high power components.*

Dangerous voltages are present in the following areas:

- Line Voltage - 120 VAC or 230 VAC
- Workstation Monitors - 15,000 Volts

If the equipment must be serviced with the covers removed, observe the following precautions:

DANGER: *Disconnect both AC and battery power before discharging static electricity in electrolytic capacitors, or high voltage cables. Failure to heed this message WILL result in death or severe personal injury.*

Allow adequate time for static charges to dissipate before touching circuit components. Discharge high voltage cables and system CRTs for at least five minutes. Discharge the high energy capacitors for at least half an hour

WARNING: *Get someone to watch while you work near high voltages. That person must remain clear of all circuitry and be prepared to turn off the power to the system and render aid in an emergency.*

WARNING: *High voltage cables, electrolytic capacitors, and CRTs can retain a dangerous static charge for long periods after power is removed from the system. Some devices can acquire a charge spontaneously without direct contact with other circuitry. DO NOT touch these components unless the system is powered down and you have discharged them completely.*

WARNING: *Systems with battery packs can deliver high currents at high voltage. Electric shock from batteries can cause death or personal injury, including severe burns. Use extreme caution when working on circuits energized by or located near the batteries. Batteries are dangerous at all times and cannot be quickly discharged like CRTs and capacitors. Setting the battery pack circuit breaker to OFF removes battery current from other circuitry, but DOES NOT render the batteries harmless.*

CAUTION: *Never operate the system unless all potential equalization conductors (green wire with a yellow stripe) and related components are fastened in place. Dangerous electrical shock and improper equipment operation can otherwise result.*

CAUTION: *Remove all metal rings and watchbands before working on system circuitry. Skin burns can result when metal jewelry short circuits system electrical currents.*

CAUTION: *Do not ship system batteries with exposed terminals. Use factory-supplied shipping containers that cover the terminals with insulating material and are strong enough to contain the weight of the batteries during rough handling.*

Explosion

DANGER: *Never operate the system in the presence of flammable anesthetics or other flammable or explosive liquids, vapors, or gases. Arcs that occur during normal operation of switches and other components WILL ignite combustible liquids, vapors, or gases, causing fire and explosion.*

If flammable or explosive substances are detected:

1. DO NOT plug the system in.
2. DO NOT turn the system on.
3. If the system is already plugged in, DO NOT unplug it.
4. If the system is already turned on, DO NOT turn it off.
5. DO NOT operate light switches or other electrical equipment.
6. Evacuate all personnel immediately.
7. Notify the hospital administration and/or fire department.
8. Ventilate the room to clear the air of all flammable vapor or gas.
9. Identify and remove the source of the flammable liquid, vapor, or gas.

X-Radiation

CAUTION: *Systems with X-ray tubes produce potentially dangerous ionizing X-radiation when energized. Never operate the system carelessly or without X-ray shielding in place. Use lead aprons, eye protection, thyroid protection, and similar devices to protect yourself and others.*

Mechanical Motion

CAUTION: *To avoid collisions with people and equipment, pay careful attention when operating motorized equipment.*

Safety Interlock

WARNING: *Never bypass, jumper, or otherwise disable any system safety feature.*

Warning Labels

Heed any warning labels, that are attached to system components:

Note: *Even though this manual is supplied only in English, some labels may have a foreign language equivalent that will appear on your system.*

Symbols

Be familiar with the following symbols that appear on equipment and schematics so you can safely maintain and operate the system:

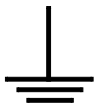
Dangerous Voltage

This symbol identifies areas where high voltages above 1500 VAC or 1500 VDC may be present. Use appropriate safety precautions.

Protective Earth Ground

This symbol identifies the system's protective earth ground terminal, which is the grounding prong on the AC power plug. This connection must be in place at all times for safe system operation.

Earth Ground Connection



This symbol identifies an earth ground connection that is necessary to maintain circuit functionality.

X-Ray Source

This X-Ray Source symbol appears on system controls you use to produce ionizing X-radiation, and on system indicators that activate when the system generates X-rays. Use appropriate precautions and use protective equipment when using system controls, and at all times when X-rays are present.

Potential Equalization Terminal

This symbol identifies system terminals which, when connected together, are at the same potential (not necessarily earth ground). Green/yellow wires normally connect potential equalization terminals together.

Anesthetic Proof Equipment

This symbol identifies equipment that is anesthetic proof in accordance with the requirements of IEC 60601-1. Never use non anesthetic-proof equipment in the presence of flammable vapors, liquids, or similar substances. Caution must be taken to prevent flammable anesthesia from coming in contact with circuit components that are not rated for anesthetic.

Attention

Attention, see accompanying documentation.

Unauthorized Modifications

WARNING: *Never perform unauthorized modifications to equipment. Doing so could result in death, personal injury, and equipment damage.*

Note: *All GE OEC Medical imaging systems comply with International Electrotechnical Commission safety standard IEC 60601-1. Do not connect any external device to the system that does not meet the requirements of IEC 60601-1 or other IEC or ISO safety standards. Only devices provided by or approved by GE OEC Medical Systems should be connected to the system.*

When properly assembled with a compatible beam limiting device, GE OEC medical imaging systems comply with the **Federal Performance Standards for Diagnostic X-Ray Systems** (21 CFR 1020.30-32), provided no components or parts are removed from the equipment and no unauthorized adjustments are present in the beam limiting device or tube housing assembly.

- Never operate the system with any part of the housing or beam-limiting device removed.
- Never adjust any part of the beam-limiting device unless you are directed to do so by the manufacturer.
- Install all mechanical hardware (i.e., screws, nuts, bolts, etc.) that you removed during equipment maintenance or repair.
- Install all EMI-RFI shielding components you removed during equipment maintenance or repair. Replace any damaged shielding gasket to ensure that the system continues to comply with EMI-RFI regulations.

Certified Components

The operating condition of certain components is critical to safety and proper equipment function. When you work on or replace any of these components, you must certify in writing that you have correctly installed, repaired, or replaced the component in accordance with the manufacturer's specifications. Complete FDA Form 2579, and file it with the FDA and any local U.S. regulatory agency. For original installations, submit the Assembler copy of FDA Form 2579 to GE OEC Medical Systems, Inc. For service calls, retain the Assembler copy with your service records. The following are certified system components.

- Beam limiting device
- Image intensifier assembly
- Spot film device (cassette holder - optional)
- X-Ray control/generator assembly
- Table top - radiographic

Service Philosophy

The Medical Imaging Systems use precision components and manufacturing techniques that meet stringent regulatory requirements. Component-level repairs that maintain compliance with these requirements are sometimes not possible in the field. The system is therefore designed to be field serviceable at the modular (printed circuit board) level. This service manual makes every effort to provide comprehensive service information that is designed to help expedite fault isolation to the field replaceable assembly level and decrease product down-time.